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AF Research Lab powers NASA's land-imaging satellite

by John Brownlee, Space Vehicles Directorate

KIRTLAND AFB, N.M. — Launched on November 21 from Vandenberg AFB, Calif., aboard the first in a series of NASA Earth Observing (EO) satellites was the Air Force Research Laboratory's Lightweight Flexible Solar Array (LFSA).

The LFSA is a small experimental version of a 700-watt, power-generating array that will supply electricity for future spacecraft. Technically equivalent to its eventual full-size counterpart, LFSA will blaze the way for thin-film photovoltaics, recently developed "smart" mechanisms, and multifunctional structure-based "flex" interconnect technologies. LFSA offers higher total system specific power (Watt/Kg) than any previous flight-qualified solar array.

It will also use "shaped memory hinges" to gently unfold itself from a stowed launch configuration and avoid the shock often associated with pyrotechnic release devices that can damage sensitive satellite payloads.

Sponsored by AFRL, built by Lockheed-Martin Astronautics, and managed by NASA's Goddard Space Flight Center, LFSA aboard EO-1 offers an unprecedented power-to-weight ratio of 100 Watt/Kg power efficiency compared to the 40 Watt/Kg supplied by conventional solar arrays on satellites today.

"Modern satellites are complex machines with increasingly diverse missions and require more electrical power than ever before," said Gene Fosness, AFRL Space Vehicles Directorate engineer. "And because it costs roughly $10,000 for every pound launched into space, all satellite components must be made as light as possible, which of course includes solar array panels. By lowering the weight and mass of satellite subsystems, more room is available for mission payloads."

LFSA consists of very lightweight composite, window frame-like structures that contain a thin-film, light sensitive "copper-indium di-selenide" compound that turns solar energy into electricity.

"Though solar power has been around for decades, the essence of our LFSA experiment is to demonstrate that we can more than double the currently available power by using extremely lightweight materials that convert a greater percentage of the sun's energy into usable electricity," Fosness said. "We also need to confirm that the flexible deployment mechanism is friendly to delicate payloads. Further, we will measure the success of both experiments to withstand long-term exposure to radiation, atomic oxygen, and the stresses of heat and cold as the spacecraft passes repeatedly through the sunlit and darkened phases of its orbit," Fosness said.

IS AN EO ET'S RELATIVE?— Pictured is an artist's concept of an Earth Observing (EO) satellite. A satellite of this type was recently launched carrying AFRL's Lightweight Flexible Solar Array (LFSA), which is a small experimental version of a 700-watt, power-generating array that will supply electricity for future spacecraft.

Part of NASA's New Millennium Program, EO-1 is flying three advanced land-imaging instruments that will lead to a new generation of lighter, better performing, and lower-cost Landsat-type imaging instruments for earth science missions.

EO-1 is flying in formation with the existing Landsat-7 satellite and will take a series of the same images. Comparison of these "paired scenes" will help specialists evaluate

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EO-1's instruments.

In addition to AFRL's LFSA, EO-1 carries six other experimental spacecraft technologies. One is a "carbon-carbon radiator" developed through an AFRL/NASA/Industry Consortium that helps dissipate unwanted heat from the satellite's core. **@**